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March 31, 1993

**TO:** File

**THROUGH:** Daron Haddock, Permit Supervisor

**FROM:** James D. Smith, Reclamation Specialist JDS

**RE:** Technical Completeness Review of Mining and Reclamation Plan
Submitted for Permit Renewal
Received January 12, 1993
Genwal Coal Company, Crandall Canyon Mine
ACT/015/032, Folder #2, Emery County, Utah

## SUMMARY

Chapter 14 referred to Chapter 6 of the M&RP for most of the geologic information, but Chapter 6 in the old, approved plan did not include the right-of-way and state leases. Chapter 6 in this renewal submittal is still lacking in geologic data needed to evaluate the mine plan, especially in the right-of-way and the state leases.

Hiawatha seam thickness is shown on an isopach map in Chapter 7 but the discussion in Chapter 6 is unclear as to what thickness of coal will be removed and if a realistic thickness for mined coal has been used in determining effects of subsidence. The overlying coal seams are described as uneconomical, but there are no data in Chapter 6 to substantiate this for the areas of the right-of-way and the state leases. The one coal analysis of the Blind Canyon seam in Chapter 6 indicates coal quality similar to the Hiawatha seam.

Language in Chapter 6 indicates that it has not been updated to include the Utah state leases or the right-of-way. Because of this, the following review does not contain detailed **Proposal** or **Analysis** sections to accompany many of the deficiencies, as the deficiencies derive mainly from this overall failure to update.

Chapter 6 has been organized and divided to closely follow the format of the current State Regulations.

page 6-1

**6.10 Introduction.**

**Proposal:**

This chapter discusses geologic conditions within and adjacent to Genwal Mine Permit area, which consists of Lease Areas SL 062648 and UO54762.

**Analysis:**

Only the two federal leases are listed. The Right-of-Way and the two state leases that are also included in the permit area are not

mentioned.

**Deficiency:**

1. The two state leases and the right-of-way and areas adjacent to them are not included in the description of the permit area.

**6.21 General Requirements.**

page 6-2

**Proposal:**

Regional geology is shown on Plate 6-1 and in Appendices 6-3 and 6-4. Local geology is on Figure 7-1.

**Analysis:**

The M&RP is a public document available for examination by interested parties, who may not be well acquainted with the area. The permit area is outlined partially on Plate 6-1 and is not marked on maps in Appendices 6-3 and 6-4. Copy quality of maps in the appendices is poor enough that it is difficult to locate the permit area using township and range coordinates; township and range coordinates do not appear to be marked on the index map in Appendix 6-4. Figure 7-1 has not been updated to include the state leases.

**Deficiency:**

1. The poor quality of the copies of maps in Appendices 6-3 and 6-4 limits their usefulness.

2. The state leases and right-of-way are not marked on Plate 6-1.

3. The permit area is not outlined on maps in Appendices 6-3 and 6-4.

4. Figure 7-1 does not have an up-to-date outline of the entire permit area and doesn't even include all of the area covered by the state leases.

page 6-3

**Proposal:**

Elevations in the permit area rise to 9600 feet and maximum overburden thickness is approximately 1700 feet with an average of 700 to 800 feet.

Due to erosion, no geologic formations which lie stratigraphically above the Price River Formation are present in the permit area.

**Analysis:**

This information has not been updated to include the state leases. Overburden thickness, maximum and average, should be considerably more when the state leases are included.

North Horn Formation, indicated by $T_w$ on Plate 6-1, is exposed at the surface over a large portion of the state leases and right-of-way.

The geology of Joe's Valley is not discussed. The surface water drainage divide between Joe's Valley and Huntington Canyon is one major regional feature of importance. Faults, especially those along the west side of East Mountain, and their roles as conduits or barriers to ground

water movement between Joe's Valley and Huntington Canyon drainages need to be characterized. Additional issues related to these faults that need to be considered include: 1) subsidence induced landslides on the west slope of East Mountain; 2) possible effects on mine development and coal recovery; and 3) larger than predicted surface subsidence caused by remobilization of fault blocks along these fault surfaces.

**Deficiency:**

1. Comments on overburden thickness (and elevation) have not been updated to include the state leases, the right-of-way, and the adjacent areas.

2. Comments on geologic formations exposed in the permit area have not been updated to include the state leases, the right-of-way, and the adjacent areas.

3. The structural geology of Joe's Valley and the west side of East Mountain and potential impacts of mining on ground and surface water, landslides and slope failure, coal recovery, and subsidence are ignored in this section.

**6.22 Cross Sections, Maps and Plans.**

**Proposal:**

Stratigraphic sections are shown in Appendices 6-1 and 6-4 and drill hole results and cross sections are in Appendix 6-5. Geologic, Structure, and Overburden and Isopach maps are shown on Plate 6-1, Appendix 6-3, and Plate 6-2 respectively.

**Analysis:**

Plate 6-2 covers only the original permit area.

Deficiency 1.c. from Division Order #92-A maintained 1) that the mine layout for all existing and proposed mine workings should show the overburden contours; 2) that the contours should be projected over the entire permit area (not just the lease area); and 3) that they should be shown at a minimum contour interval of 100 feet and a map scale of 1"=500'.

Plates 5-2a and 5-2b show structural elevation of the coal seam and surface topography, from which the overburden thickness can be determined, over the active and proposed mine workings. The structure contours at the southwest corner of Lease ML 21568 appear to be unrealistic artifacts or edge effects of a contouring program, perhaps indicating insufficient geologic data in this area. Figure 5-6 shows overburden thickness for the permit and surrounding areas, at a contour interval of 100' and at a scale of approximately 1"=3000'. Wayne Western has stated that a scale of 1"=1000' will be sufficient, rather than 1"=500' as in the original deficiency.

**Deficiency:**

1. Overburden thickness is not mapped at a sufficiently large scale over the entire permit and adjacent areas.

**Analysis:**

Deficiency 2 from Division Order #92-A, under **R645-301-622. Cross Sections, Maps and Plans.**, states that "Maps and cross

sections indicating the location of all coal seams should be presented in the plan with sufficient detail to determine their potential minability. In those areas where the Operator has committed to accomplish additional drillhole information, the tentative locations of these holes, and the type of data to be collected from these holes should be characterized."

Deficiency 1 under **R645-301-522. Coal Recovery.** is similar, stating that the Operator must address and characterize all coal and rider seams found within the state leases.

Larry Johnson has indicated that isopachs for the coal seams above the Hiawatha were made for the R2P2; these maps should be added to the M&RP if they provide the needed information, especially for the state leases. Appendix 6-5 contains vertical sections showing the thickness and location of these seams relative to the Hiawatha seam, but only in the area of the original federal leases. Cross sections and maps in the M&RP do not show interburden and seam thicknesses and the extent of coal seams above the Hiawatha. There are insufficient data presented in the M&RP to determine the minability (or un-minability) of coal seams above the Hiawatha for the entire permit area. (Comments on the minability of the overlying Cottonwood, Blind Canyon, and Bear and Upper Bear seams are on pages 14-1 and 14-2 of Chapter 14.)

Locations of additional underground drillholes are shown on Plates 5-2a and 5-2b, but the text has not been updated to describe them or the type of data to be collected from them. (These are described on page 14-2 of Chapter 14.)

**Deficiency:**

1. Maps and cross sections indicating the location of all coal seams in sufficient detail to determine their potential minability have not been made part of the M&RP.

2. Information on the proposed in-mine drillholes is lacking.

**6.22.1 Test Borings and Coal Sampling.**

**Analysis:**

Bore hole and core sampling information for the federal leases is in Appendix 6-5 and on Plate 6-2.

Bore hole locations for the state leases are on Plate 5-2 but the labels are not legible and there are no elevations; however, bore hole locations and elevations are on Plates 5-2A and 5-2B.

It is not clear which portions, if any, of the bore holes were cored.

**Deficiency:**

1. Maps, cross sections and plans referenced by this section of the M&RP do not show locations or elevations of test borings except for the locations of the two in mine up-hole borings done in federal lease SL 062648 (Plate 6-2 and Appendix 6-5).

2. Locations and elevations of core samplings are not clear from information given in the M&RP.

page 6-3

**6.22.2 Coal Seams, Overburden, Stratum Below Coal Seams.**

**Proposal:**

There is sufficient technical information to determine the nature, depth and thickness of the coal seams, and the thickness and extent of all formations in the area adjacent to the mine area.

**Analysis:**

The proposal as it is given in chapter 6 applies only to the original permit area included in the two federal leases. The limited amount of data referred on this page has been sufficient to characterize the relatively small area covered by these two leases, but the addition of the right-of-way and the two state leases has greatly expanded the permit area and the adjacent area and the amount of information needed for characterization.

Locations of stratigraphic sections "A" and "B" in Appendix 6-1 are shown on Plate 6-2 but this is not noted in Appendix 6-1. Section "A" shows two unidentified coal seams greater than 5 feet in thickness above the Hiawatha seam, but correlative seams on "B" are under 5 feet thick. The Blind Canyon seam isopach on Plate 6-2 shows thinning of the Blind Canyon seam between "A" and "B" and, based on the two in-mine borings, thinning to the north also. The isopach does not extend beyond the south half of lease SL 062648.

Plate 6-2 shows the isopach of the Hiawatha seam in lease SL 062648 only. No reference is made to maps (unnumbered Figures) in Chapter 5 that show Hiawatha seam thickness, structure, and overburden thickness.

There is no isopach of the second overlying coal seam (Bear Canyon ?), although data in Appendices 6-1 and 6-5 indicate it is too thin to be economically mined within the federal leases. There are no data on this seam for the right-of-way, the state leases, and the adjacent areas.

Topography and coal seam elevation (? - not labeled) for the state leases, from which overburden thickness can be derived, are shown on Plates 5-2A and 5-2B but these maps are not referenced in this section. Neither Plate 5-2A, 5-2B, nor Plate 6-2 includes overburden thickness information for the right-of-way.

**Deficiency:**

1. Coal seams are not identified on stratigraphic sections "A" and "B".

2. There are no isopach maps of the two main overlying coal seams for the right-of-way, state leases, and adjacent areas.

3. Reference is not made to Plates 5-2A and 5-2B that provide Hiawatha seam elevation, structure, and overburden thickness information for the state leases. The data represented by the contours on Plates 5-2A and 5-2B are not identified.

4. Reference is not made to the unnumbered figures in Chapter 5 that show Hiawatha seam thickness, structure, and overburden thickness.

5. Interburden or overburden thickness for the overlying coal seams is not shown on maps or cross sections for the state leases, right-of-way, or adjacent areas.

page 6-4

**Proposal:**

Drilling results obtained in 1985 indicate the Blind Canyon seam is not thick enough to mine. The USGS is satisfied the upper seams are of no economic importance (refer to Appendix 6-2). Additional geologic information has been obtained from publications and other sources.

**Analysis:**

Data used to characterize the Blind Canyon seam in Chapter 6 is based on drilling done in 1985 that appears to involve only the original permit area covering the federal leases. There are no data presented to support a conclusion that this seam is not minable in the state leases. Reference is made to Appendix 6-2 to support the USGS determination of no economic importance for the overlying coal seams, but rock and coal analysis results located there do not appear related to such a determination.

The nature of the Hiawatha coal is described using results of analyses, but there is nothing on the nature of the coal from the overlying coal seams, except for one set of sulfur analyses on page 6-8 that is not referred to here.

Additional geologic information was submitted by "Mr. Wollen", but it is unclear if this refers to measured sections in Appendix 6-1 and analyses in Appendix 6-2 or to something else. There is no information on Mr Wollen, his qualifications to provide information, or his connection to the operator.

Geologic structure maps and measured coal outcrop sections by Doelling (1972) are in Appendices 6-3 and 6-4, but copies of Doelling's Lower Coal Structure map in Appendix 6-3 and Index map in Appendix 6-4, which shows the locations of the coal sections, are poor quality and of limited use. The coal thicknesses measured by Doelling and shown in Appendix 6-4 are not incorporated into maps, cross sections, or plans as part of the M&RP.

**Deficiency:**

1. There is nothing in Appendix 6-2 to indicate the overlying coal seams are not of economic importance.

2. No information is provided to support a conclusion that overlying coal seams are not minable in the portion of the permit area covering the state leases.

3. The qualifications of Mr. Wollen, the nature of the information supplied by him, and conclusions based upon that information are not clear.

4. Data from Doelling (1972) are presented in Appendix 6-4 but do not appear to have been used in determining nature, depth, and thickness of the coal seams and overburden in the permit and adjacent areas nor to have been incorporated into the maps, cross sections, and plans of the M&RP.

Coal Reserves

**Deficiency:**

1. Coal reserve estimates given here for the Hiawatha seam include only reserves in the two federal leases.

2. Coal reserves in the overlying coal seams are not estimated or discussed for areas outside the federal leases.

page 6-5

**Proposal:**

Coal deposit and reserve information is required by 30 CFR 211.10(c)(6)(i) which must conform with the information submitted with the mining and reclamation plan.

**Analysis:**

The reference to CFR 30 211.10(c)(6)(i) is outdated. The information on Reserve Classifications, Stratigraphy, and Structure given here could be used to augment sections R645-301-624 and R645-301-625.

Coal thickness of up to 14 feet indicated on this page is not mentioned elsewhere and does not show on Plate 6-2: the Hiawatha isopach in Chapter 5 only shows 11 feet maximum thickness. Sulfur content of the coal is given here as 0.30% to 1.00%, but as 0.3% to 0.8% on page 6-4. Dip in the region is described as 1-3 degrees to the west, but beds are shown dipping to the southeast on Plates 6-2, 5-2A, and 5-2B. Fault alignments and offsets discussed here are not mentioned in other sections of the M&RP.

**Deficiency:**

1. The reference to CFR 30 211.10(c)(6)(i) is outdated.

2. There are either minor differences between data presented here and in other parts of the M&RP, or information is given here that is not found elsewhere in the M&RP where it might be equally appropriate.

page 6-6

**6.22.3 Coal Outcrop / Strike and Dip**

**Deficiency:**

1. References to Plates 5-2 and 5-2C as showing outcrops and strike and dip are no longer accurate.

**6.22.4 Gas and Oil Wells**

**Deficiency:**

None.

**6.23 Geologic Determinations**

**Proposal:**

Required information on potentially acid- and toxic-forming materials is found in Sections 6.24.32 and 6.24.33 and Appendix 6-2. Subsidence control and monitoring are discussed in Section 5.25 and

Appendix 5.

**Analysis:**

DOGM does not make the determination of potentially acid- and toxic-forming characteristics; this is part of the operators responsibility in preparing the Mining and Reclamation Plan. Potentially acid- and toxic-forming materials are discussed under Sections 6.24.32 and 6.24.33 below.

Plate 6-2 is referred to as the source of overburden thickness for determining subsidence effects. Plate 6-2 does not include the right-of-way or the state leases. The overburden isopach map in Chapter 5 is not referenced; maximum thickness of overburden shown on that map is 2100 feet, not 1700 feet as stated on page 5-16.

In Section 5.25, maximum subsidence is calculated based on removal of 6 feet of coal, yet on page 5-7 it is stated that first mining will take up to 9 feet of coal where possible; it is unclear if more than 9 feet will be recovered by first mining in any part of the mine. It is also unclear if additional coal thickness beyond 9 feet may be removed during second mining. Maximum coal thickness is given as 14 feet on page 6-5 but only shown as 11 feet on the Hiawatha seam isopach in Chapter 5.

**Deficiency:**

1. Overburden thickness data used in Section 5.25 do not appear to include the state leases or right-of-way.

2. Maximum subsidence is not determined using the maximum thickness of coal that the plan states **will** be removed.

3. Maximum thickness of coal that **can or might** be removed (or is available for removal) is not clear.

## 6.24 Geologic Information

**Proposal:**

The Starpoint Sandstone is an important regional aquifer that lies below the lowest coal seam to be mined.

The Blackhawk Formation may contain perched aquifers in lenticular sandstones, and flow of this perched water to deeper strata or to springs could be affected by drilling or subsidence from mining. Low permeability shales are bentonitic and swell when wet, tending to seal faults and fracture and to limit secondary permeability.

**Analysis:**

Regional and structural geology are discussed in Section 6.21. but there is no description in Section 6.21 or 6.24 of the effect of regional and structural geology on the occurrence, availability, movement, quantity, and quality of potentially impacted surface and ground water. The geology of Joe's Valley is not discussed. The surface water drainage divide between Joe's Valley and Huntington Canyon is one major regional feature of importance. Faults, especially those along the west side of East Mountain, and their roles as conduits or barriers to ground water movement between Joe's Valley and Huntington Canyon drainages need to be characterized.

**Deficiency:**

1. The M&RP does not show how the regional and structural geology may

affect the occupance, availability, movement, quantity, and quality of potentially impacted surface and ground water.

page 6-7

**Proposal:**

Reference is made to Appendix 6-1 and Plate 6-2 as basis for the geological description of the area. Additional information on the regional and structural geology is found in Section 6.21.

**Deficiency:**

1. There is much more information available on maps, cross sections, and plans than is referenced here.

**6.24.2 Chemical Analysis of Overburden**

**Deficiency:**

None.

**6.24.3 Chemical Analysis / Lithology**
**6.24.31 Drill Hole Logs**

**Proposal:**

Drilling results and details are summarized in Appendix 6-5. Additional information on lithology and potential impacts of mining on ground water is provided in Section 6.24.

**Deficiency:**

1. More data are available than what are referenced here.

2. No information on ground waster in bore holes is presented in Appendix 6-5 nor in Section 6.24.

**6.24.32 Chemical Analysis - Strata**

**Proposal:**

Pyrite, alkalinity, and clay content information is in Appendix 6-2.

page 6-8

Pyrite and alkalinity of strata immediately above and below the Hiawatha seam are summarized on page 6-8.

**Analysis:**

Locations where the samples were collected are not given; the first assumption is that they are from measured sections "A" and "B". If so, they represent basically one point in the permit area.

The basis for determining acid- and toxic-forming potential of strata overlying and underlying the Hiawatha seam for the entire mine is

only two samples, one floor sample (19306) that indicates marginally acceptable acid-base potential and unacceptably low paste pH and one roof sample (19305) that shows acceptable values. On the other hand, little of the floor rock has been brought from the mine in the past or probably will be brought from the mine in the future. These are two considerations to be balanced in assessing the need for further sampling and analysis to characterize the acid-forming potential of strata above and below the seams to be mined in the permit area. The sample of floor rock from the Blind Canyon seam (19308) also appears to be from potentially acid-forming material: paste pH values are too low and the acid-base potentials are just within acceptable values.

Presentation of analysis results is not clear: alkalinity values on page 6-8 appear to be reported as a range of values, but by referring to the data sheets in Appendix 6-2, it is found that the first number is paste pH and the second is alkalinity in mg/l.

**Deficiency:**

1. Results of rocks sample analyses found in Appendix 6-2 are not summarized clearly or adequately on page 6-8.

2. Sample locations are not identified.

3. The potential acid-forming material in the floor rock indicates further sampling and analysis may be warranted. This is not discussed.

### 6.24.33 Chemical Analysis - Coal

**Proposal:**

The sulfur and iron sulfide content of the coals are given.

**Analysis:**

Page 6-8 gives sulfur and iron sulfide content for the Hiawatha and Blind Canyon seams, but only one laboratory report for coal analysis is found in Appendix 6-2. Sampling locations are not identified on either page 6-8 or in Appendix 6-2. Sulfate, organic sulfur, and pyritic sulfur are presented on page 6-8, but the coal analysis report in Appendix 6-2 does not include a break down of total sulfur into those three forms.

Sulfur content of the coal is given on page 6-5 as 0.30% to 1.00%, and as 0.3% to 0.8% on page 6-4. The values given on page 6-8 lie within those ranges, but these various values indicate there is more coal analysis data available than is considered here or included in Appendix 6-2.

The acid-base potential determined for this coal (-11 tons $CaCO_3$/1000 tons) was based on total sulfur rather than on pyritic sulfur or pyritic plus organic sulfur, so the reported value may be unrealistically low. The reported value is too low to allow the coal to be within the root zone when the site is reclaimed; however, with the current operation plan there is only a small amount of coal temporarily stockpiled before shipping and there should not be any significant amount of coal on site to deal with at the time of reclamation. Therefore the acid-forming potential of this coal does not seem to be a problem. It is suggested, however, that any future determination of acid-base potential be done on the basis of pyritic and organic sulfur rather than total sulfur.

**Deficiency:**

1. Sample location(s) is(are) not identified.

2. Analysis results given on pages 6-4, 6-5, and 6-8 do not conform with each other and evidently are based on more than the single lab report in Appendix 6-2.

3. The M&RP does not mention the unacceptably low acid-base potential of the coal indicated by the analysis report in Appendix 6-2.

**6.24.34 Properties of Strata Above and Below Coal**

**Proposal:**

Mining is done using standard room and pillar mining operations. Stratigraphic sections in Appendix 6-1 and drilling results in Appendix 6-5 do not show any clays or soft rock above or below the Hiawatha seam.

**Analysis:**

Each mining operation should be specifically designed based on properties of the coal and the overlying and underlying strata in order to minimize dangers to the miners, minimize subsidence, and maximize coal recovery and profitability.

The absence of clay or soft rock at the outcrops and in the roof at the two drill holes does not characterize the entire permit area; three of these four sample points are within 600 feet of each other and the forth is roughly a half mile from those three. Mining in the state leases will extend 2 to 3 miles from these points and variations in roof and floor rock lithology (i.e., potential thickening of the clayey shale that is shown on Section "B" in Appendix 6-1 between the coal and Star Point Sandstone) would not be unexpected over such a distance.

Determination of properties is limited to describing rock type and color. Except for the outcrops, there are no determinations of properties for the floor rock. Information on roof and floor strata should be updated, ideally from bore holes done in advance of the mining but also from over- and undercasts, roof falls, bolt holes, etc., and, if needed, the mining operation plan should be modified.

**Deficiency:**

1. Information on roof and floor strata have been included for only a small area of the mine that does not include the right-of-way or the state leases.

**6.27 Overburden Thickness and Lithology**

**Deficiency:**

1. Current information is not referenced.

pages 6-8 and 6-9

**6.30 Operation Plan**
**6.31 Casing and Sealing of Exploration Holes and Boreholes**
**6.31.1 Temporary Casing and Sealing of Drilled Holes**
**6.31.2 Permanent Casing and Sealing of Exploration Holes and Boreholes**
**6.40 Performance Standards**

**6.41 All Exploration Holes and Boreholes**

**Proposal:**

Each exploration hole, borehole, well, or other exposed underground opening other than those used exclusively for blasting will be cased and sealed. Methods will include filling with cuttings or inert material until it is level with the surface. Holes that flow or have the potential to flow will be cemented, and holes that penetrate two or more aquifers with significantly different ground water quality will be cased or cemented.

Holes that remain open for use as water supply wells or ground water monitoring wells will be completed with casing or piezometers so as prevent drainage of surface water or other material into the well, will be fitted with caps, and when no longer needed will be abandoned in accordance with the measures described above.

Permanent closure methods will be designed to prevent access to the mine workings and to keep acid or other toxic drainage from entering water resources.

**Analysis:**

The commitment is made to case **and** seal each exploration hole, borehole, well, or other exposed underground opening other than those used exclusively for blasting. To avoid unnecessarily stringent requirements and/or to prevent confusion it should be made clear that exploration holes, boreholes, etc. that do not remain open for use as water supply wells or ground water monitoring wells will normally not be completed with casing. They may be plugged, capped, sealed, backfilled or otherwise managed to protect water resources without the use or installation of casing, but casing will be used if it is needed.

Exploration holes or boreholes are not wells according to the definition in the Division of Water Rights (DWtrR) Rules for Water Well Drillers, but monitoring wells (and wells for other uses) are under the jurisdiction of the DwtrR and are to be installed and abandoned according to DWtrR Rules. The procedures outlined in the M&RP generally appear to meet the requirements of DWtrR rules, but use of a licensed driller is not mentioned for installation and abandonment of wells. Use of a licensed driller should avert potential problems.

**Deficiency:**

1. The conditions in which casing will or will not be used need to be clarified.

2. There is no commitment that installation and abandonment of monitoring wells (and other wells) will be done by a licensed driller following Division of Water Rights rules and procedures.

**6.42 Monuments and Surface Markers**

**Deficiency:**

None.

Check for Clarity

page 6-3 - second sentence in second paragraph, beginning "The maps submitted..."
- second sentence in last paragraph, beginning "These geologic..."
page 6-5 - first sentence in fifth paragraph, beginning "An accurate..."

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